Bandwidth Analysis

ABSTRACT

This paper calculates present bandwidth usage and future anticipated bandwidth usage for the RDA-RPG wideband link.

The estimated transfer rates for the RDA to RPG interface are tabulated below. The estimates only include radial data transfered during operational VCPs. There is an estimated minimum, average, and maximum transfer rate for each VCP, as applicable. Omitted in estimates is the additional payload of status data. The estimated maximum is based on a worse-case future VCP, which is subject to the limitation of the maximum rated antenna rotation speed. The estimate may be less depending on how efficient the packaging of radial data is into the 4096 byte frame.

The Point-to-Point Protocol (PPP) frame size for radial data consists of 2400 bytes of radial data, plus 16 bytes of message header, plus 12 bytes of data with no significance, plus 12 bytes for the application TCP header. Due to the MTU of the Ethernet, the RDA will send 3 Ethernet packets with each radial of data. For each of the three packets, there will be 40 bytes for the std header plus 4 bytes of data for PPP frame overhead. A radial frame size = (2400 + 16 + 12 + 12) + 3(40 + 4) = 2572 bytes.

Note: 2400 bytes of radial data is composed of 100 bytes of configuration data + 460 bytes of reflectivity data + 920 bytes of velocity data + 920 bytes of spectrum width data.
Note: The total bits/sec for each VCP = Frames/sec * Bits/Frame = Bits/Sec.
Note: Frames/sec (5.31) = radials(e.g. 0.014) * revolutions/sec (378.95)

VCP's	**Antenna Scan Rate (RPM)**	**Antenna Scan Rate (RPS)**	**1 Rev/ Beamwidth (360º/1º)**	**Frames/ Sec**	**Radial Frame Size (2574 bytes * 8 bits/byte)**	**Bits/Sec**
31	0.84	0.014	360	5.05	20,576	103,909
32 Min	0.68	0.011	360	4.08	20,576	83,950
32 Ave	0.75	0.012	360	4.51	20,576	92,798
32 Max	0.83	0.014	360	4.98	20,576	102,468
21 Min	1.86	0.031	360	11.18	20,576	230,040
21 Ave	2.02	0.034	360	12.14	20,576	249,793
21 Max	2.4	0.040	360	14.42	20,576	296,706
11 Min	2.69	0.045	360	16.16	20,576	332,508
11 Ave	3.57	0.060	360	21.40	20,576	440,326
11 Max	4.28	0.071	360	25.71	20,576	529,009
Estimated Max	6	0.100	360	36.04	20,576	741,559

Table I: VCP bandwidth analysis

Table II below quantifies the amount of bandwidth impact due to each future enhancement listed.

Enhancement	Bandwidth Impact	Estimated Max (bits/sec)
¼ km Reflectivity Range Bins	x1.55 Increase	1,149,416
½ degree Azimuthal Sampling	x2 Increase	2,298,832
Cluttered & Uncluttered Data Streams	x2 Increase	4,597,664
Dual Polarization	x2 Increase	9,195,328

Table II: Bandwidth usage for worst-case VCP for anticipated enhancements